

Terms of reference (ToR) for the procurement of services below the EU threshold

CONFIDENTIAL

Study on improving forecasting & scheduling of wind energy in India	Project number/ cost centre: G-012382-001 Tender number 1009001
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0. List of abbreviations

AG	Commissioning party
AN	Contractor
AVB	General Terms and Conditions of Contract for supplying services and work
CERC	central electricity regulation commission
CDM	Clean development mechanism
DSM	Deviation settlement mechanism
FK	Expert
FKT	Expert days
GW	Gigawatt
KZFK	Short-term expert
LCOE	Levelized cost of energy
MNRE	Ministry of New and Renewable Energy
NIWE	National Institute of Wind Energy
NOC	No objection certificate
PPA	Power purchase agreement
RE	Renewable Energy
RPO	Renewable purchase obligation
ToRs	Terms of reference
WIPPA	Wind independent power producer association

1. Background

Wind power plays a pivotal role in India's energy transition as the country advances towards its target of achieving 500 GW of non-fossil fuel capacity by 2030. Yet, the increase of variable renewable energy from intermittent renewable sources such as solar and wind needs an upgrade and adjustment of the power system. Power from wind is particularly crucial to assure grid stability throughout the day (24 hours available) and as well as to compensate peak electricity demands in the evening times when solar power cannot fulfill the demand.. However, the electricity system that once enjoyed "must-run" status until 2021 is now facing increased curtailment due to grid instability owing to increased feed-in of electricity generated by intermittent renewable energy. Since March 2025, nearly 4 GW of wind-solar generation has reportedly been curtailed in Rajasthan alone. To address growing concerns over grid stability, the Central Electricity Regulatory Commission (CERC) has further proposed tightening the Deviation Settlement Mechanism (DSM) for wind, solar, and hybrid projects, effective April 2026. The Commission intends to transition from a capacity-based deviation framework to a more stringent schedule-based system.

While these measures are welcomed for strengthening grid stability, they have also introduced significant economic stress for wind Independent Power Producers (IPPs), especially those operating legacy projects developed under a more lenient DSM regime. A recent study by Grid-India shows that potential revenue losses for wind IPPs are likely to be the highest amongst solar, hybrid, and other generation assets. Under the proposed DSM tolerance band, solar projects may face revenue losses ranging from 3.5% to 11.1%, hybrid projects from 2.4% to 11.8%, and wind projects from 2.8% to as high as 48.2%. The disproportionately higher impact on wind reflects their inherent variability a more comprehensive forecasting challenges.

Against this background, GIZ aims to commission a study which reflects best international practises and lessons learned from Europe and other countries facing similar situations with an increased share of variable renewable energy in the electricity mix. The study will address the growing concerns over revenue risks for wind IPPs, the challenges in accurate wind forecasting and scheduling frameworks sustaining a the business models of IPPs. Globally, countries such as Germany and other EU member states have developed sophisticated forecasting and scheduling systems to manage and feed-in high shares of variable renewable energy into the grid. These more mature markets also rely on well-established ancillary and grid-responsive services that help to uphold grid stability and constant supply during peak demand. India can draw valuable lessons from international experience while adapting appropriate solutions and innovating de-novo approaches tailored to its unique meteorological patterns, grid characteristics, market conditions and the permanently increasing demand for electricity.

"Achieving India's renewable energy target" is a bilateral project under the Indo – German Energy Programme being implemented in India by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of the Federal Ministry of Economic Cooperation and Development (BMZ). The project supports the Ministry of New and Renewable Energy (MNRE) in India to improve the regulatory, technical and human resources capacities to implement the 500 GW RE target of the country.

1.2 Target group of stakeholders

IPPs and other concerned stakeholders. A close collaboration with WIPPA as an implementation partner is envisioned. Regulators and policy makers are the other relevant stakeholders to inform about best international practises of how to deal with wind power in a system of rising intermittent renewable energy in the system.

2. Tasks to be performed by the contractor

2.1 General Term of Reference

The Terms of Reference (TOR) covers the scope and deliverables by the consultant(s) for conducting a study on the wind forecasting methodologies for the Indian power market and lessons learned from other countries for adjusting the power system due to rising power generation from intermittent renewable energy.

This assignment consists of one work package as main task as mentioned below:

Work Package 1:

The main activities listed in the TOR document serve as a general framework for the activities planned, but the contractor is also expected to be flexible in response to changing support requirements and new developments not foreseeable at the time of commissioning.

The individual mobilization of experts will be coordinated by the GIZ project coordinators in India in close coordination with the contractor.

The contractor is responsible for providing the following services:

WP 1: Enhancing wind energy forecasting & scheduling in India

This assignment consists of three major tasks.

Task 1: Analysis of wind forecasting and international best practices

Under this task, the consultant has to analyse and document national and international best practices on wind forecasting system while considering the following points but not limited to:

1. A detail assessment on how wind forecasting systems in European countries like (Germany, Denmark, Spain, and other), USA, Australia and Asian with high share of RE by focusing on the methodologies of wind forecasting and its role for grid stability. The study is to examine various
 - Wind forecasting methodologies and business models adopted by power system operators (public and private) in the above-mentioned countries,
 - the enabling environment that incentivises accurate scheduling, and takes the effectiveness of penalties versus incentives into consideration
 - agencies / departments / organizations involved in providing services like data collection, verification and validation, integrated platforms, arbitration processes and other measures needed for adjusting the power system to rising RE
 - experiences in evaluation and adaptation of forecasting errors, time resolution & system infrastructure
 - deviation settlement mechanisms in countries with a high share of RE, especially wind power
2. Assessing and documenting international practices that can be successfully transferred to India after adaptation to India's weather patterns, geographical diversity, institutional framework and policy landscape.

3. Providing case studies from the globe and selected IPPs to illustrate the real-world economic impacts of accurate wind forecasting .
4. A summary of the data publicly available on India's wind energy generation profile throughout the year and daytimes.
5. Based on point 4, a detail summary on wind forecasting case studies on (but not limited to)
 - a shorter time to medium-range scale for grid management and power trading
 - sub-seasonal to seasonal scales for proper power purchase planning
6. A comparative assessment of European Centre for Medium-Range Weather Forecasting (ECMWF) model and Indian models e.g. by National Centre for Medium Range Weather Forecasting (NCMRWF)
7. Recommendation on seasonal wind power prediction model-methodologies-technologies using weather and climate models
8. A study on near-surface (up to 200 m) wind speed taking different seasonal variabilities over Indian regions for wind power generation into consideration.

Deliverable(s)

1. Comprehensive report incorporating all the points under task 1.
2. Knowledge dissemination session(s) with nodal agencies, GIZ and other relevant stakeholders to discuss the results and outcomes of the activities carried out under this task in the format of workshop(s), presentation(s) and round table discussions.

Task 2: Analyzing Indian regulatory & technical methodologies

Under this task, the consultants are to analyse policies and , regulations related to deviation settlement mechanism and wind forecasting while considering the following points but not limited to:

1. In-depth analysis of CERC DSM regulations with all the recent amendments, focusing on the evolution of deviation bands and X-factor trajectories.
2. Analysing the impact of wind (power) forecasting results considering the error range from 2% to 50% (with breaking interval of 10) on CERC deviation settlement mechanism for IPPs
3. A study on the methodology for converting probabilistic wind forecasts into deterministic day ahead schedules. This should also include power curve modelling, the impact of wake effects within wind farms, prediction of ramp events, and optimisation algorithms aimed at minimising expected deviation penalties.
4. Recommendations on decision-support tools for scheduling entities and the critical role of short-term forecasting in real-time dispatch adjustments.
5. Recommendations on models of wind forecasting for avoiding over-feeding the grid.
6. Comparative assessment on feed-in tariffs being a long-term solution as compared to the deviation settlement mechanism as applied in India.
7. Recommendations on any arbitration mechanism that supports the feed-in of power generated by variable renewable energy.
8. Analysis of the role of grid flexibility, storage solutions, and ancillary services in enhancing wind power integration in India.
9. Recommendations to policymakers on evidence-based insights to recalibrate DSM regulations, ensuring that such measures drive improvements in forecasting without undermining the economic viability of the wind sector.

Deliverable(s)

3. Comprehensive report incorporating all the points under task 2.
4. Knowledge dissemination session with nodal agencies, GIZ and other relevant stakeholders to discuss the results and outcomes of the activities carried out under this task in the format of workshops, presentations and round table discussions.

Task 3: Framework design on data collection, verification & validation for wind forecasting models

Under this task, the consultant is meant to fulfil following tasks:

1. As-is analysis of the current state of meteorological instrumentation for Indian wind sites, with a particular focus on identifying data gaps in offshore / nearshore and complex terrain locations such as mountainous areas.
2. Analysis and recommendation on standards for data accuracy: collection frequency, verification and validation process, forecasting models, tuning of models, result evaluation and others.
3. Recommendations on building a more robust data base in India by several means like meteorological towers, satellite data integration, as well as protocols for data sharing among IPPs, grid operators, and forecasting agencies.
4. Recommendations on improving the general database for wind forecasting
5. Recommendation on improving the institutional forecasting architecture
 - conceptual framework for a National Wind Forecasting Centre, integrating the IMD's observational network, NCMRWF's numerical models (including the Weather Research and Forecasting Model and ensemble prediction systems), machine learning techniques, and site-specific historical data.
 - key architectural considerations will include data assimilation, model selection for varying forecast horizons, uncertainty quantification, and processes for continuous validation.
6. Stakeholder's mapping of different governance structures, funding mechanisms, and the division of responsibilities between central agencies and state utilities.

Deliverable(s)

5. Comprehensive report incorporating all the points under task 3
6. A detailed report in form of roadmap incorporating all the tasks under WP 1 with professional graphical-pictorial representation.
7. Continuous knowledge support till finalisation of the roadmap.
8. Knowledge dissemination session(s) with nodal agencies, GIZ and other relevant stakeholders to discuss the results and outcomes of the activities carried out under this task in the format of workshops, presentations and round table discussions.
9. Final Report including all the point under Task 1, Task 2 and Task 3. The Contractor will provide a smaller and concise report for the policy makers.

Please note:

- The contractor is responsible for selecting, preparing, training and steering the international and national, short and long-term experts assigned to perform the tasks in this ToR.
- The contractor is assigned with the task to provide regular project status update reports and meetings with GIZ and the partner agency.
- The contractor provides equipment and supplies (consumables) and assumes the associated operating and administrative costs.

- The contractor manages costs and expenditures, accounting processes, and invoicing in line with the requirements of GIZ.
- The contractor reports regularly to GIZ in accordance with the current AVB of the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

Please note that the consultant is responsible for any data/information collection, analysis, contacting and conducting meetings with the organisation to fulfil the needs of this assignment. And upon request of partner and/or GIZ, an onsite presence of consultant at partner premises might be required to carry out project related activities.

In addition to the reports required by GIZ in accordance with the AVB, the contractor submits the following reports:

- Inception report
- Contributions to reports to GIZ's commissioning party
- Brief quarterly or half-yearly reports on the implementation status of the project

Certain milestones, as laid out in the table below, are to be achieved during the contract term:

Milestones/process steps/partial services	Deadline from the date of award
1. Deliverable 1 & 2	1 month
2. Deliverable 3 & 4	2 months
3. Deliverable 5, 6, 7, 8 & 9	3 months

Period of assignment: from 15.05.2026 until 15.02.2027.

3. Concept

In the tender, the bidder is required to show *how* the objectives defined in Chapter 2 (Tasks to be performed) are to be achieved, if applicable under consideration of further methodology-related requirements. In addition, the bidder must describe the project management system for service provision.

Note: The numbers in parentheses correspond to the lines of the technical assessment grid.

Technical-methodological concept

Strategy (1.1): The bidder is required to consider the tasks to be performed with reference to the objectives of the services put out to tender (see Chapter 1 Context) (1.1.1). Following this, the tenderer presents and justifies the explicit strategy with which it intends to provide the services for which it is responsible (see Chapter 2 Tasks to be performed) (1.1.2).

The bidder is required to present the actors relevant for the services for which it is responsible and describe the **cooperation (1.2)** with them.

The tenderer is required to present and explain its approach to **steering (1.3)** the measures with the project partners (1.3.1) and its contribution to the **results-based monitoring system (1.3.2)**.

The tenderer is required to describe the key **processes (1.4)** for the services for which it is responsible and create an **operational plan** or schedule (1.4.1) that describes how the services according to Chapter 2 (Tasks to be performed by the contractor) are to be provided. In particular, the tenderer is required to describe the necessary work steps and, if applicable, take account of the milestones and **contributions** of other actors (partner contributions) in accordance with Chapter 2 (Tasks to be performed) (1.4.2).

The tenderer is required to describe its contribution to knowledge management for the partner (1.5.1) and GIZ and to promote scaling-up effects (1.5.2) under **learning and innovation (1.5)**.

Project management of the contractor (1.6)

The tenderer is required to explain its approach for coordination with the GIZ project. In particular, the project management requirements specified in Chapter 2 (Tasks to be performed by the contractor) must be explained in detail.

The tenderer is required to draw up a **personnel assignment plan** with explanatory notes that lists all the experts proposed in the tender; the plan includes information on assignment dates (duration and expert days) and locations of the individual members of the team complete with the allocation of work steps as set out in the schedule.

The tenderer is required to describe its backstopping concept. The following services are part of the standard backstopping package, which (like ancillary personnel costs) must be factored into the fee schedules of the staff listed in the tender in accordance with Section 3.3.1 of the GIZ AVB:

- Service-delivery control
- Managing adaptations to changing conditions
- Ensuring the flow of information between the tenderer and GIZ
- Assuming personnel responsibility for the contractor's experts
- Process-oriented steering for implementation of the commission
- Securing the administrative conclusion of the project

4. Personnel concept

The tenderer is required to provide personnel who is suited to filling out the positions described, on the basis of their CVs (see Chapter 7), the range of tasks to fulfill and the required qualifications.

The below specified qualifications represent the requirements to reach the maximum number of points in the technical assessment.

Team leader

Tasks of the team leader

- Overall responsibility for the advisory packages of the contractor (quality and deadlines)
- Coordinating and ensuring communication with GIZ, partners and others involved in the project

- Personnel management, in particular identifying the need for short-term assignments within the available budget, as well as planning and steering assignments and supporting local and international short-term experts
- Regular reporting in accordance with deadlines
- Presentation of the results to the stakeholders where required

Qualifications of the team leader

- (2.1.1) Education/training: Advanced university degree (Master's or equivalent) in relevant field (engineering / science / business administration).
- (2.1.2) Language: Good business language skills in English (C1 and above) is **mandatory**. Failure to meet this criterion will result in the exclusion of the offer.
- (2.1.3) General professional experience: 10 years of professional full-time experience in renewable energy / power sector. Part-time professional experience cannot be counted.
- (2.1.4) Specific professional experience: S/he should have professional experience of 7 years demonstrating:
 - Experience on forecasting technology specifically for wind energy system and on European Centre for Medium-Range Weather Forecasting (ECMWF) model.
 - Experience on business operation & model of forecasting technology
 - Experience on the policy-regulation-deviation settlement mechanism related to wind forecasting area.
- (2.1.5) Leadership/management experience: 8 years of management/leadership experience as a project team leader or manager in an organization.
- (2.1.6) Regional Experience: S/he should have experience working with International DSO / IPP / wind forecasting agencies.
- (2.1.7) Development cooperation experience: S/he should have experience in development cooperation project design and implementation.

Key Expert 1

For the technical assessment, an average of the qualifications of all specified members of the expert pool is calculated. Please send a CV for each pool member (see below Chapter 7 Requirements on the format of the bid) for the assessment.

Qualifications of the Key Expert

- (2.2.1) Education/training: Advanced university degree (Master or equivalent) in relevant field (engineering / social science / business administration / economics or physics).
- (2.2.2) Language: Good business language skills in English (C1 and above) is **mandatory**. Failure to meet this criterion will result in the exclusion of the offer.
- (2.2.3) General professional experience: 10 years of professional full-time experience in renewable energy / power sector. Part-time professional experience cannot be counted.
- (2.2.4) Specific professional experience: S/he should have professional experience of 7 years demonstrating:
 - Experience on forecasting technology specifically for wind energy system and on National Centre for Medium Range Weather Forecasting (NCMRWF) model.
 - Experience on business operation & model of wind forecasting technology
 - Experience on the policy-regulation-deviation settlement mechanism related to wind forecasting area.

- (2.2.6) Regional Experience: S/he is meant to have experience working with Indian DISCOMs / SLDC / IPP / wind forecasting agencies / NIWE.

Short-term expert pool with pool with 3 members

For the technical assessment, an average of the qualifications of all specified members of the expert pool is calculated. Please send a CV for each pool member (see below Chapter 7 Requirements on the format of the bid) for the assessment.

Qualifications of the short-term expert pool

- (2.6.1) Education/training: Advanced university degree in relevant field (engineering / science).
- (2.6.2) Language: Fluent in English (C1 and above) is **mandatory**. Failure to meet this criterion will result in the exclusion of the offer.
- (2.6.3) General professional experience: 6 years of professional full-time experience in renewable energy / power sector. Part-time professional experience cannot be counted.
- (2.6.4) Specific professional experience: All 3 experts should have combined experience of 4 years demonstrating:
 - Experience on the global best practice and standards for wind forecasting technologies
 - Experience on the policies-regulations-DSM related to wind forecasting technology
 - Experience on advanced data management system for weather forecasting system.
- (2.6.5) Regional Experience: The pool should have experience working on National and International projects with SLDC / IPP / wind forecasting agencies / NIWE.

The tenderer must provide a clear overview of all proposed short-term experts and their individual qualifications.

5. Costing requirements

Assignment of personnel and travel expenses

Per diem allowances are reimbursed as a lump sum up to the maximum amounts permissible under tax law for each country as set out in the country table in the circular from the German Federal Ministry of Finance on travel expense remuneration (downloadable from the [German Federal Ministry of Finance – tax treatment of travel expenses and allowances for international business travel as of 1 January 2024/2025 \(GERMAN ONLY\)](#)).

Accommodation allowances are reimbursed as detailed in the specification of inputs below.

With special justification, additional Accommodation costs up to a reasonable amount can be reimbursed against evidence.

All business trips must be agreed in advance by the GIZ officer responsible for the project

Sustainability aspects for travel

GIZ has undertaken an obligation to reduce greenhouse gas emissions (CO₂ emissions) caused by travel. When preparing your tender, please incorporate options for reducing emissions, such as selecting the lowest-emission booking class (economy) and using means

of transport, airlines and flight routes with a higher CO₂ efficiency. For short distances, travel by train (second class) or e-mobility should be the preferred option.

CO₂ emissions caused by air travel must be offset. GIZ specifies a budget for this, through which the carbon offsets can be settled against evidence.

There are many different providers in the market for emissions certificates, and they have different climate impact ambitions. The [Development and Climate Alliance \(German only\)](#) has published a [list of standards \(German only\)](#). GIZ recommends using the standards specified there.

Specification of inputs

Fee days	Number of experts	Number of days per expert	Total	Comments
Designation of TL	1	10	10	
Designation of Key Expert	1	15	15	
Designation of short-term expert pool	3		60	
Travel expenses (working)	Quantity	Number per expert	Total	Comments
Per-diem allowance in country of assignment	25	22.-€	550.-€	Per-diem in India as lump sum/per day.
Overnight allowance in country of assignment	25	80.-€	2.000.-€	Overnight stays in India against evidence.
Transport	Quantity	Number per expert	Total	Comments
International flights <i>India</i>	5	1.500.-€	7.500.-€	Travel to the place of service delivery: India Against evidence
Domestic flights	8	200.-€	1.600.-€	Flights within the country of assignment during service delivery Against evidence

CO₂ compensation for air travel- International flights	10	90.-€	900.-€	A fixed budget is earmarked for settling carbon offsets against evidence .
CO₂ compensation for air travel-Domestic flights	16	50.-€	800.-€	A fixed budget is earmarked for settling carbon offsets against evidence .
Travel expenses (train, car) • car/taxi/etc.	25	50.- €	1.250.-€	Travel within the country of assignment, transfer to/from airport etc.
Other travel expenses	5	100.-€	500.-€	e.g. visa costs against evidence
Other costs	Number	Price	Total	Comments
Flexible remuneration	1	5.000.-€	5.000.-€	A budget is foreseen for flexible remuneration. Please incorporate this budget into the price schedule. against evidence Use of the flexible remuneration item requires prior written approval from GIZ.
Workshops	2	1.000.-€	2.000.-€	A budget of EUR 2000.- is earmarked for workshops, round tables etc. against evidence. The budget will cover the costs related to hosting the workshop / roundtables / meeting etc., including venue booking, catering, event materials preparation, photography, and other logistical expenses strictly associated with the events. The maximum no. of participants in each event will be 50.

6. Workshops, events and trainings

The contractor is responsible for all the arrangements and coordination (with the stakeholders) for the implementation of the 3 (three) workshops / meeting / training courses and others.

The budget will cover the costs related to hosting the workshop / roundtables / meeting etc., including venue booking, catering, event materials preparation, photography, and other logistical expenses strictly associated with the events. The average no. of participants in

each event will be 50 and tentative locations could be Delhi, Gujarat, Chennai or any other state of India.

7. Requirements on the format of the tender

The structure of the tender must correspond to the structure of the ToR. In particular, the detailed structure of the concept (Chapter 3) should be organised in accordance with the positively weighted criteria in the assessment grid (not with zero). The tender must be legible (DINA 4 font size 11 or larger) and clearly formulated. It must be drawn up in **English** (language).

The complete tender must not exceed **20 pages** (excluding CVs). If one of the maximum page lengths is exceeded, the content appearing after the cut-off point will not be included in the assessment. External content (e.g. links to websites) will also not be considered.

The CVs of the personnel proposed in accordance with Chapter 4 of the ToRs must be submitted using the format specified in the terms and conditions for application. The CVs shall not exceed **4 pages** each. They must clearly show the position and job the proposed person held in the reference project and for how long. The CVs can also be submitted in English (language).

Please calculate your financial tender based exactly on the parameters specified in Chapter 5 Quantitative requirements. The contractor is not contractually entitled to use up the days, trips, workshops or budgets in full. The number of days, trips and workshops and the budgets will be contractually agreed as maximum limits. The specifications for pricing are defined in the price schedule.